that is, the practice of setting fire to the trees in order to clear the ground, is still carried on extensively. The clearing away of the woods is to prepare the ground for agriculture, but as much or more by the preparation of the soil as by obtaining space for the cultivation contemplated, and this is the peculiarity of the usage. The trees growing on the spot selected are burned, and the seed is sown on the soil thus manured with the ashes of the trees. The effects of *sartage* in other European countries, in India, and in North America, are brought under notice and discussed at some length. In France it is a practice recognised both in forest science and in forest management, but whereas it was formerly resorted to largely it is now adopted only in special circumstances. It is there found that the oak, particularly a hardy variety known as the *rouvre,* of all forest trees sustains best the treatment of *sartage.* In the Ardennes the coppice woods of *rouvre,* which are so treated, yield excellent firewood and charcoal. The burning is carried out in August and September, and, at the proper time for sowing cereals, rye or buckwheat is scattered over the ground and covered with a light hoe. After the crop is reaped the young tree-shoots begin to grow rapidly, but it is often necessary in order to insure perpetuity of good growths to plant out seedlings, and this is especially the case with the oak.

At the present time there are in Finland districts in which *sartage* is now prohibited, others in which it is carried on under restrictions, and others in which it is tolerated and apparently freely practised. Should the cleared ground not be retained permanently under agriculture, it is likely to become covered again with a crop of self-sown trees, of the same kind as those destroyed, or of a kind of higher pecuniary value. On the banks of the Saima See, for example, fir trees have been replaced either by firs or by birch. The fir or pine may be of more value for building purposes, but the birch supplies a better firewood, and for this there is and probably will long continue an ever-increasing demand in St. Petersburg, to which it can be sent from most places in Finland by water.

When a crop of trees after destruction is not replaced by another crop, the proximate effect upon the climate is generally considered to be beneficial to agriculture. But in Sweden in many districts in which the forests have been cleared away it is remarked that spring now begins a fortnight later than it did in the last century, and this is attributed to protracted frost due to diminished humidity of the atmosphere.

The improved forest economy of France dates from the issue of the celebrated Forest Ordinance of 1669, if not from a much earlier period. But in Finland all improvements in forest economy have been effected since 1809, and particularly during the last twenty-five years. Though formerly an independent country, Finland was for a long time a province of Sweden, and in 1809 it was annexed to the dominions of Russia as a Grand Duchy, with the enjoyment of pre-existing privileges and of government under its own laws issued in accordance with its Constitution. In 1848 were sent out Imperial Instructions relative to the management of the Crown forests, along with regulations respecting projected surveys, and in 1858 new arrangements for the management of these forests were made.

The forest administration of Finland is now in the hands of well-trained officers, and much of the lavish waste of former days has ceased. By giving more attention to considerate thinning, by more skilful conservation and more scientific exploitation, it was felt that the "produce and the products of the forests might be equalised approximately, if not perfectly," and one object aimed at in the inspection of forests is to prevent the removal of trees being effected more rapidly than the re-growth. As has been remarked, Finland has a constant market for firewood and timber in St. Petersburg, where firewood is now more expensive than coal brought from Britain.

It is to its School of Forestry at Evois that Finland looks for its supply of trained forest conservators. This school was opened in 1859, and intending students were required to produce before admission a university diploma, or a first class certificate of the completion of the course of study at a gymnasium. Closed after a time from lack of students, it was reorganised and reopened in 1874. The course of study occupies two years, and the subjects are forest science, surveying, engineering, rural economy, legal economy, and drawing. In July and August the pupils are required, for the sake of practice, to measure fields and woods, and to estimate the quantities of standing timber. We observe that under forest science is included "the science of hunting," whereat many an English youth would no doubt be inclined to say "Happy Finlanders!" Officered by men trained in this school, the Finnish forest administration is now in a position to attain objects identical with those of the advanced forest economy of Europe: first, to secure a sustained production from the forests; secondly, to secure along with this an amelioration of their condition; and thirdly, a reproduction of them by self-sown seed when felled.

Readers who are interested in forest conservancy will find much valuable information in the middle section of Dr. Brown's work. The subject is one which must ere long force itself on the attention of political economists. The reckless clearances that have been effected in our Canadian territories are approaching a limit; the most cautious estimates do not allow a longer period than fifteen years for the exhaustion of our Canadian timber lands at the present rate of consumption, and one very trustworthy and experienced authority limits it to seven years.

W. FREAM

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Optical Phenomena

THE phenomenon described as "Cloud-Glow" by your correspondent, Mr. F. A. R. Russell, in NATURE of the 15th inst. (p. 55), and by Mr. J. J. Walker in your last issue (p. 77), was observed here by me; as, however, the time my observation commenced (5 p.m.) was three-quarters of an hour later than the time given by Mr. Russell (4.18 p.m.) it is probable that many of the features described by him had faded before the phenomenon came under my notice. As seen by me, the appearance consisted of an arc-like mass of glowing vapour of a ruddy hue,

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but of a tint not familiar to me, in the western horizon, extending from the north-west to a point near the South Pole. The centre of the mass was about due west, and was there some 25° above the horizon. There was no wind; there were no cirri. The sky was clear and the air transparent, and I could not associate the appearance with anything like a "cloud-glow." It seemed to me like the blaze of a great conflagration seen through a smoky medium, and I expected every moment to see the fire-engines rush past me. At dark (6 p.m.) there were long pallid streaks of polar auroral light, proceeding from a centre in the north-west. These presented no signs of the flickering activity usually accompanying auroral manifestations. Soon after 7 p.m. all traces of polar aurora vanished. It may be mentioned that, while instances of aurora have been common here throughout the autumn, on one occasion only have flashing rays and beams been present.

Every sunset since the 9th, when the condition of the weather permitted—somewhat rarely—the remarkable glow under notice has been visible in the west, sometimes marked and prominent, as on the 17th inst., at others somewhat indistinct, according as the state of the atmosphere served.

Here to-day, after the storms of yesterday, blue sky prevailed, and the afternoon proved favourable for observation. The sky was clear; the air, washed by frequent rains, was transparent; wind south-west and tranquil; barometer low; thermometer at 2 p.m. 48°. At 4 p.m. a great arc like bank of dusky coloured vapour, extending as before from north-west to south, was discernible. On the sun declining behind the mass, it was suddenly shorn of its beams, and looked like the moon when rising. In a few minutes the vaporous bank assumed the peculiar vivid ruddy hue distinctive of the phenomenon; the blue colour of the sky changed to green. The green was speedily replaced by the ruddy tint before described, which presently suffused the whole hemisphere, tinged the entire landscape, and presented an appearance of which I have never seen the like. The colour was deeper round the horizon than at the zenith. The colour gradually faded as the vaporous glowing mass sank in the western horizon, and at 5.30 had left no trace.

Worcester, November 26 J. Ll. Bozward

P.S.—The atmospheric effect described as cloud-glow was visible here to-night. There was a cloud canopy, but at 4.30 the ruddy light was visible under the canopy over the whole hemisphere. The ruddy light was manifest in a marked manner at sunrise on the 24th, and was discernible this morning. Probably the phenomenon is attributable to the aqueous vapour in suspension in the atmosphere. J. Ll. Bozward

Worcester, November 27

The remarkable cloud-glow after sunset on November 9 was seen by me at Sudbury on the southern border of Suffolk. I was struck by the softness and uniformity as well as brightness of the glow, and by its contrast with the pale greenish hue of the clear sky around, from which it was separated by a frame of nearer clouds in shade. When I first noticed it the (upper) margin was about 15° above the horizon (estimated from memory). Presently the glow diminished in brightness and increased in extent upward to about 40° above the horizon; and at the highest (nearest) part the delicate structure of the cirrus was visible.

Was it noticed at any place further north than Sudbury?

Woodbridge, November 25 Hubert Airy

In travelling up from Leeds on Monday afternoon I was able to watch the whole progress of the remarkable sunset sky on that afternoon. The sun went down quite clear, and the sky was all but cloudless. Shortly after sunset a crimson arch appeared stretching from south-east to north-east, with a very clear greenish blue sky beneath it in the east. This crimson arch gradually proceeded westwards over the sky, and at about 4.20 was stretching from south-west to north-west. At this time it developed a number of well-defined, pointed rays or streamers radiating from the point where the sun was below the horizon. Between the arch and the western horizon was a sky of a bright silver-white colour, which was so brilliant that it gave us quite a second daylight. The crimson arch continued to sink towards the western horizon, the streamers still retaining the same relative positions. At about 4.40 it formed simply a bright crimson band along the western horizon, and the streamers still pointing out from it gave the appearance of some large forest on fire in the west. Finally, at 4.50, when we were some twelve miles north-west of Nottingham the crimson arch had entirely vanished below the horizon. At one time, when the arch was at its brightest, with the silver-white sky beneath it, it had exactly the appearance of the aurora, except that the streamers remained fixed in relative position. In the silver-white sky there seemed to be a very thin cloud layer. A. Tarn

31, Mornington Road, N.W., November 27

Optical phenomena of a peculiar nature appeared here on the 25th and 26th inst. On the 25th, shortly before sunset, the atmosphere, which was exceedingly clear except in the west, was suffused with a brilliant tint of lake. Over and to the left of the sun, which appeared to shine with a remarkably white light, there was a heavy cumulus, the edges of which were tinted with a strange, olive-green colour. After sunset the sky in the east became gradually of a more brilliant rose tint, which continued a long time after the sun's rays ceased to be reflected from a long, curled streak of cirro-filum, at an altitude of 2600 feet. The sky nearer the zenith at 5 p.m. appeared to be of a sea-green tint. A little later, the most brilliant rose-coloured glow covered the western and south-western sky, which continued up to about 5.45 p.m., and might easily have been mistaken for a red aurora.

On the 26th a similar phenomenon took place upon a grander and more unusual scale. At 3 p.m., when the sky was totally devoid of higher cloud, the sun, which was shining with a remarkably white light like the electric light, was surrounded by a very broad halo of a uniform *pale pink* colour, whose exterior margin was very ill-defined. This halo was of about 22° radius and was totally devoid of the usual prismatic tints. A little before sunset the sky, which was clear except in the distant south-west, where there was a thin bank of cirriform cloud, became of a bright salmon colour. At 4.35 there was a beautiful display of *rayons du crépuscule* in the east-north-east, there being six larger and some smaller lake-coloured belts. But the most splendid phenomenon was yet to come. From 5.5 to 5.15 p.m. a brilliant arc of red light having the position of the sun for its centre, and having an altitude of about 25°, illuminated the western heavens. This light was bright enough to cast a vivid red glare on all objects seen in the opposite direction. From this arc throughout the whole of its extent arose bright rays of red light, divergent from the sun's position, the perpendicular one in the centre extending nearest to the zenith. The arc gradually sank towards the horizon, following the sun's westward declining course.

The barometer at the time was very low, the temperature high, and there was marked "visibility." To-night (27th) there is again a red glow, seen feebly through a thick sheet of cirriform cloud.

Is it possible that particles of ice-dust carried upwards to a great altitude in the extensive cyclonic disturbances now prevalent may have produced these phenomena? In any case it seems clear that the reflecting matter was in the first case very equally diffused, having no tendency to arrange itself in strips or cloudlets; in the second place of considerable vertical thickness; and thirdly, that its greatest altitude was upwards of thirteen English miles.

I hope that some of the readers of Nature who have witnessed these phenomena may be able to explain them, and not least of all the pink halo. Annie Ley

Ashby Parva, Leicestershire, November 27

In connection with different singular atmospheric phenomena noticed lately in India, Ceylon, and even in our own country, I think an extract from a letter received by the last Cape mail may prove of interest to some of your readers. I may premise that my correspondent resides upon an open Karoo plain, where the atmosphere is always clear; such a "phenomenon" as a *fog* being unknown, and where the sunsets generally are of a beauty that I have not seen surpassed even in the tropics, a beauty, however, very evanescent, for it will be remembered that in those latitudes there is little or no twilight.

The letter is from about thirty-five miles south of Graaff Reinet, and is dated October 21. "Many of us out here are much interested in a very peculiar light visible in the west nearly every evening about an hour after sunset. It lasts until quite dusk, and throws a sort of lurid glare over everything, and the sky is angrily red; I have not seen anything about it in the

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